UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/826,757 | 04/15/2004 | Brad A. Reger | 5693P037X | 1208 |

48102 7590 09/21/2007
NETWORK APPLIANCE/BLAKELY
1279 OAKMEAD PARKWAY
SUNNYVALE, CA 94085-4040

| EXAMINER | |
|---|---|
| WALTER, CRAIG E | |
| **ART UNIT** | **PAPER NUMBER** |
| 2188 | |
| **MAIL DATE** | **DELIVERY MODE** |
| 09/21/2007 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/826,757 | REGER ET AL. | |
| | Examiner | Art Unit | |
| | Craig E. Walter | 2188 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *17 July 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *14-16* is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *9/7/07;7/17/07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 17 July 2007 has been entered.

### *Status of Claims*

2. Claims 1-16 are pending in the Application.

Claims 1, 2, 4 and 7 are amended.

Claims 1-13 are rejected.

Claims 14-16 are allowable.

### *Response to Amendment*

3. Applicant's amendments and arguments filed on 17 July 2007 in response to the office action mailed on 20 April have been fully considered, but they are not persuasive. Therefore, the rejections made in the previous office action are maintained, and restated below, with changes as needed to address the amendments.

### *Claim Objections*

4. Claims 1-13 are objected to because of the following informalities:

As for claims 1 and 7, acronyms, such as "JBOD", should be not used to abbreviate key phrases in the claims unless they are first introduced in their non-abbreviated form (i.e. "Just a Bunch of Disks (JBOD)).

Claims 2-6 and 8-13 are further objected to for inheriting the deficiencies of claims 1 and 7 respectively.

Appropriate correction is required.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1, 2, 5, 7-9, 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over DeKoning et al. (US Patent 5,975,738), hereinafter DeKoning, and in further view of Dimmick et al. (US Patent 5,193,050), hereinafter Dimmick.

As for claim 1, DeKoning teaches a method of reconfiguring a storage system, the method comprising:

operating a standalone storage server (Fig. 1, RDAC #1 and #2 operate independently of each other) which includes a plurality of mass storage devices and a first storage server head to access the mass storage devices in response

to client requests, wherein the first storage server head has ownership of the plurality of mass storage devices (referring to Fig. 1, the RAID subsystem (100), contains a plurality of controllers (i.e. heads – 118.1, 118.2), connected to a plurality of mass storage devices (110). The controllers receive access requests via the hosts (120.1, 120.2) – col. 6, lines 9-40. Each LUN within the array of storage devices is associated (i.e. assigned) to one of the two controllers as primary controller. The remaining controller is the secondary or redundant controller – col. 7, lines 13-22); and

converting the standalone storage server into a JBOD set (the controllers are interchangeable so as to allow a failing controller unit to be easily disconnected and removed from the storage subsystem (col. 6, line 63 through col. 7, line 12. Note once the server head is disconnected from the array of disks, the array can no longer function as a RAID array (i.e. absent any intelligent logic controlling how the data is written to the disk), hence they remain a JBOD set. Also, note, Applicant clearly defines "converting the standalone storage server into a JBOD set as including "removing the first storage server head from the chassis" in claim 4. In other words, once the failing controller is disconnected, the array is effectively converted to JBOD as per Applicant's description); and

integrating the JBOD set into a modular storage server system to enable the plurality of mass storage devices to be controlled by a second storage server head (again, the controllers are interchangeable so as to allow a failing controller

unit to be easily disconnected and removed from the storage subsystem (col. 6, line 63 through col. 7, line 12), including reassigning ownership of at least one of the mass storage devices to the second storage server head, independently of a configuration of physical connection which connects the second storage server head to the plurality of mass storage devices (the redundant controller assumes ownership of the LUNs if a failure is detected in the primary controller –col. 7, lines 23-31).

Despite these teachings, DeKoning fails to teach his first storage head and storage devices as being within a chassis, wherein the second storage server head is external to the chassis as recited in this claim.

Dimmick however teaches a enclosure for electronic subsystems in a data processing system, which he teaches the use of a single enclosure (i.e. chassis) incorporating several individual modules to form an integrated subsystem for data processing systems (col. 1, lines 7-11) – see also Fig. 1.

As for claims 2 and 7, DeKoning teaches a method of reconfiguring a storage system, the method comprising:

operating an integrated storage system which includes a plurality of mass storage devices and a storage server head to access the mass storage devices in response to client requests, wherein the storage server head has ownership of the plurality of mass storage devices (referring to Fig. 1, the RAID subsystem (100), contains a plurality of controllers (i.e. heads – 118.1, 118.2), connected to a plurality of mass storage devices (110). The controllers receive access requests via the hosts

(120.1, 120.2) – col. 6, lines 9-40. Each LUN within the array of storage devices is associated (i.e. assigned) to one of the two controllers as primary controller. The remaining controller is the secondary or redundant controller – col. 7, lines 13-22);

converting the standalone storage server into a JBOD set (the controllers are interchangeable so as to allow a failing controller unit to be easily disconnected and removed from the storage subsystem (col. 6, line 63 through col. 7, line 12. Note once the server head is disconnected from the array of disks, the array can no longer function as a RAID array (i.e. absent any intelligent logic controlling how the data is written to the disk), hence they remain a JBOD set. Also, note, Applicant clearly defines "converting the standalone storage server into a JBOD set as including "removing the first storage server head from the chassis" in claim 4. In other words, once the failing controller is disconnected, the array is effectively converted to JBOD as per Applicant's description), including:

disconnecting and removing the storage server head from the mass storage devices (the controllers are interchangeable so as to allow a failing controller unit to be easily disconnected and removed from the storage subsystem (col. 6, line 63 through col. 7, line 12));

connecting an external storage server head unit to the mass storage devices (DeKoning teaches connecting both a primary and a secondary controller to the storage subsystem. Once it has been determined that the primary controller has failed, the connection between the secondary controller and the storage units is enabled allowing for control to pass to the secondary

controller – col. 7, lines 13-31. It is worthy to note that external storage controller (i.e. head) is in fact external, as it is external to the drives as shown in Fig. 1);

and using a command to reassign ownership of the plurality of mass storage devices from the storage server head to the external storage server head unit (the determination if ownership needs to be reassigned is performed via a process of exchanging software commands as per col. 3, lines 43-64).

DeKoning however fails to teach the storage server head and storage devices as being installed in a chassis prior to converting the standalone storage server into a JBOD set (as recited by Applicant in both claims 2 and 7).

Dimmick however teaches an enclosure for electronic subsystems in a data processing system, which he teaches the use of a single enclosure (i.e. chassis) incorporating several individual modules to form an integrated subsystem for data processing systems (col. 1, lines 7-11) – see also Fig. 1.

As for claim 12, though DeKoning teaches a storage server head (i.e. controller), he fails to specifically teach it as being implemented on a single circuit board. It would have been obvious to one of ordinary skill in the art at the time of the invention for DeKoning to integrate his controller (i.e. the CPU, memory and cache which comprise the controller) onto a single circuit board. By doing so, he could exploit the well-known benefits of integrated circuits utilizing a single circuit board, including improved interchangeability, and improved signal timing and integrity of the components.

DeKoning additionally fails to teach installing the controller within the chassis as recited by Applicant. Dimmick however teaches an enclosure for electronic subsystems

in a data processing system, which he teaches the use of a single enclosure (i.e. chassis) incorporating several individual modules to form an integrated subsystem for data processing systems (col. 1, lines 7-11) – see also Fig. 1.

As for claim 13, though DeKoning teaches removing a failed controller and swapping it with another controller, he fails to teach swapping these controller within the chassis itself.

Dimmick however teaches an enclosure for electronic subsystems in a data processing system, which he teaches the use of a single enclosure (i.e. chassis) incorporating several individual modules to form an integrated subsystem for data processing systems (col. 1, lines 7-11) – see also Fig. 1.

It would have been obvious to one of ordinary skill in the art at the time of the invention for DeKoning to further include Dimmick's enclosure for subsystems into his own subsystem utilizing his method for detecting failures in a redundant controller. By doing so, DeKoning could benefit by having a fully integrated unit, capable of being quickly inserted and removed without requiring any changes to the remainder of the system as taught by Dimmick in col. 1, lines 28-40.

As for claim 5, DeKoning teaches the reassigning ownership of at least one of the mass storage devices comprises using a software-based command to reassign ownership of said at least one of the mass storage devices (the determination if ownership needs to be reassigned is performed via a process of exchanging software commands as per col. 3, lines 43-64).

As for claim 8, DeKoning teaches using a command to reassign ownership of the

plurality of mass storage devices as comprising reassigning ownership of the mass storage devices independently of how the plurality of mass storage devices and the external storage head unit are physically interconnected (the redundant controller assumes ownership of the LUNs if a failure is detected in the primary controller –col. 7, lines 23-31. Also note the determination to reassigned ownership is performed via a process of exchanging software commands as per col. 3, lines 43-64).

As for claim 9, DeKoning teaches using a command to reassign ownership of the plurality of mass storage devices as comprising reassigning ownership of the mass storage devices without removing any of the mass storage devices (unlike his teachings for the controllers which are interchangeable, DeKoning does not require that the drives themselves be swapped out during the reassignment process (i.e. reassignment may occur either via software commands, or via physical swapping of the controllers)).

6. Claims 6 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined teachings of DeKoning (US Patent 5,975,738) and Dimmick (US Patent 5,193,050) as applied to claims 5 and 7 above respectively, and in further view of Brunelle et al. (US Patent 6,654,902 B1), hereinafter Brunelle.

As for claim 6, though the combined teachings of DeKoning and Dimmick disclose arbitrating ownership of a plurality of disks between multiple controllers, they fail to specifically teach storing ownership attribute bits in the disks themselves.

Brunelle however teaches a system for persistent reservation IO barriers in which a storage device itself stores an ownership identifier depending on which resource (i.e. computer) has access to that device (col. 2, lines 21-51).

As for claim 10, through the combined teachings of DeKoning and Dimmick meet all the limitations of claim 7, they fail to specifically teach storing ownership attribute bits in the disks themselves.

Brunelle however teaches a system for persistent reservation IO barriers in which a storage device itself stores an ownership identifier depending on which resource (i.e. computer) has access to that device (col. 2, lines 21-51).

It would have been obvious to one of ordinary skill in the art at the time of the invention for the combined teachings of DeKoning and Dimmick to further include Brunelle's system of persistent reservation IO barriers into his own method for detecting failure in redundant controllers using a private LUN. By doing so, they could exploit the benefits of preventing unauthorized access to his system by increasing the system's security via Brunelle's use of a registration key as taught by Brunelle in col. 1, lines 33-51.

7. Claims 3, 4 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined teachings of DeKoning (US Patent 5,975,738) and Dimmick (US Patent 5,193,050) as applied to claims 2 and 7 above, and in further view of Weber (US PG Publication 2003/0105931 A1).

As for claim 3, though the combined teachings of DeKoning and Dimmick teach all the limitations of claim 2, they fail to teach the second sever head as being external to the chassis.

Weber however teaches an architecture for transparent mirroring which utilizes a redundant controller, remote from the primary controller (see Fig. 1, element 106 and

paragraph 0027, all lines).

As for claim 11, though the combined teachings of Dekoning and Dimmick teach all the limitations of claim 7, they fail to teach connecting the external storage server head unit to a second plurality of mass storage devices, wherein the external storage server head unit further has ownership of the second plurality of mass storage devices.

Weber however teaches an architecture for transparent mirroring, which utilizes a redundant controller, remote from the primary controller connected to mirrored data storage devices (see Fig. 1, element 106 and paragraph 0027, all lines).

It would have been obvious to one of ordinary skill in the art at the time of the invention for DeKoning to further include Weber's mirroring method into his own method for detecting failure in redundant controllers using a private LUN. By doing so, DeKoning could benefit by preventing catastrophic system failure by mirroring critical data at a geographically remote location, hence enabling persistent access to critical uncorrupted data as taught by Weber in paragraphs 0001 and 0006, all lines.

As for claim 4, DeKoning teaches removing the failing unit once it's detected in order to transfer ownership to the redundant controller (col. 6, line 63 through col. 7, line 12).

### *Allowable Subject Matter*

8. Claims 14-16 are allowed for the reasons made of record 20 April 2007.

***Response to Arguments***

9. Applicant's arguments with respect to claim 1 have been fully considered but they are not persuasive.

As for claim 1, Applicant contends, "DeKoning does not teach or suggest a method of *reconfiguring* a storage system as recited in claim 1". More specifically, Applicant asserts,

> "DeKoning does not disclose or suggest either of the above-quoted operations recited in claim 1. Note that DeKoning does not relate to physical reconfiguration of a storage system, as does the present invention. Rather, DeKoning is directed to a technique for detecting and responding to a *failure condition,* i.e., the failure of a RAID controller in a storage subsystem. The present invention, on the other hand, relates to a technique for physically reconfiguring a storage system, which may be done in the absence of any failure, such as when upgrading a storage system to include a more powerful storage server "head". In particular, embodiments of the invention relate to a technique for integrating a JBOD (Just a Bunch of Disks) set, which has been obtained by converting a standalone storage server into the JBOD set, into a modular storage system, in which a separate, (e.g., more powerful) external storage server head assumes ownership of the disks (or at least some of them) in the JBOD set".

This argument however is not persuasive. More specifically, Applicant's purported benefits of reconfiguring a storage system even in the absence of any failure as taught by DeKoning are not commensurate with the scope of the claim limitations, which merely require, *inter alia*, "reconfiguring a storage system" and "converting the standalone storage server into a JBOD set". Once a failure occurs in DeKoning's system, the storage system will in fact be "reconfigured" after the second controller takes control of the array. Additionally note, once the server head is disconnected from the array of disks, the array can no longer function as a RAID array (i.e. absent any

intelligent logic controlling how the data is written to the disk), hence they remain a JBOD set. Also, note, Applicant clearly defines "converting the standalone storage server into a JBOD set as including "removing the first storage server head from the chassis" in claim 4. In other words, once the failing controller is disconnected, the array is effectively converted to JBOD as per Applicant's explicitly disclosed embodiment.

As for claim 7, Applicant asserts that DeKoning does not disclose the recited, "disconnecting" and "removing" operations as being part of the operation, "converting the integrated storage system into a JBOD set".

This argument however is not persuasive, as Examiner maintains that DeKoning in fact teaches these limitations as per the rejection and arguments presented *supra*.

***Conclusion***

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Maurer, III et al. (US PG Publication 2003/0065780 A1) teach a data storage system having data restore by swapping logical units.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Craig E. Walter whose telephone number is (571) 272-8154. The examiner can normally be reached on 8:30a - 5:00p M-F.

12. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hyung S. Sough can be reached on (571) 272-6799. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

13. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Craig E Walter
Examiner
Art Unit 2188

CEW

HYUNG SOUGH
SUPERVISORY PATENT EXAMINER
9/13/07